Plant Parasitic nematodes - Problems related to clover and organic farming

C. Magnusson and R. Holgado

Bioforsk, Norwegian Institute for Agricultural and Environmental Research, Plant Health and Plant Protection Division, Ås- Norway,(christer.magnusson@bioforsk.no)

Archived at http://orgprints.org/24544

Implications

Organic farming puts new and exciting challenges to the science of nematology. The occurrence of plant parasitic nematodes in organic farming systems needs to be investigated further. Good management strategies for nematodes should include monitoring of the composition and density of nematode populations. This would allow for increased yields and better sustainability of organic farming.

Background and objectives

Out of the more than 20 000 nematodes described, some 4000 species are parasites of plants. Plant parasitic nematodes have a mouth spear (stylet) to puncture plant cell walls, and inject secretions, which changes plant physiology and facilitates food up-take by the nematodes. Some species feed only on the outer tissue of the root system, while others penetrate deeper into roots where they may induce permanent feeding sites.

In organic farming the use of clover and other nitrogen fixating legumes is important for securing appropriate nitrogen levels. Clovers are excellent hosts for many plant parasitic nematodes. Observations in Germany indicate that problems with plant parasitic nematodes may arise after a 5 years period of organic farming (Hallmann *et al*. 2004).

The objective of this paper is to draw attention to plant parasitic nematodes as pathogens in organic farming. Their importance in clover and in subsequent crops, and the kind of symptoms they induce will also be presented.

Key results and discussion

Several nematodes thrive on clovers (Tab.1). Stem nematode (*Ditylenchus dipsaci*) is a well-known example, but also potato rot nematode (*D. destructor*), spiral nematodes (*Helicotylenchus* and *Rotylenchus*), root lesion nematodes (*Pratylenchus* spp.), clover cyst nematode (*Heterodera trifolii*), root-knot nematode (*Meloidogyne hapla*), stubby root nematodes (*Trichodorus* and *Paratrichodorus*) as well as needle nematode (*Longidorus elongatus*) are known to occur and may be frequent. Stem-, spiral-, clover cyst– and root knot nematodes may cause serious damage.

A number of species occurring in clover may cause damage in crops following clovers in rotations (Tab. 1). Stem nematode may damage strawberry, potato rot nematode may damage potato and carrot, root lesion nematodes may be pathogenic (*Pratylenchus* spp.) on all crops listed in table 1, *Meloidogyne hapla* on carrot, and, stubby root nematodes (*Trichodorus* and *Paratrichodorus*) on potato, sugar beet and carrot, and needle nematode *Longidorus elongatus* on carrot and strawberry are important pathogens.

Some nematodes damage certain crops irrespective of clover being a pre-crop (Tab. 1). Leaf nematodes (*Aphelenchoides* spp.) in strawberry, pin nematode (*Paratylenchus bukowinensis*) and carrot cyst nematode (*H. carotae*) are devastating in carrot. *M. naasi* damage certain cereals, potato cyst nematodes (*Globodera rostochiensis* and *G. pallida*),

and beet cyst nematode (*H. schachtii*) are serious pests in the respective crops. Cereal and rye cyst nematodes (*H. avenae* and *H. filipjevi*) may cause considerable damage in cereals.

Table 1. Plant parasitic nematodes which are likely to cause damage in organic farming in the Nordic area. X = occasional; XX=frequent; XXX = frequent with high damage.

NEMATODE	CLOVER	CEREALS	POTATO	SUGAR BEET	CARROT	STRAWBERRY
Stem nematode	XX					X
Potato rot nematode	X		XX		X	
Leaf nematode						XXX
Stunt nematode		X				
Spiral nematodes	XX					
Root lesion nematode	XX	X	XXX	X	XXX	X
Pin nematode					XXX	
Beet cyst nematode				XXX		
Cereal cyst nematode		XXX				
Rye cyst nematode		XXX				
Clover cyst nematode	XX					
Potato cyst nematode			XXX			
Carrot cyst nematode					XXX	
Root knot nematode	XX	X			XXX	
Stubby root nematode	X		X	XX	XXX	
Needle nematode	X				XX	XXX

Nematode damage usually appears as oval patches of poor growth. Symptoms depend on nematode species and host. Stem nematode causes basal swellings in clover, twisted leafs and necrotic bulbs in onion. Leaf nematodes induce deformed leafs and stalks in strawberry. *P. bukowinensis*, *L. elongatus* and *M. hapla* cause forked, fingered and split roots in carrot. *D. destructor* and *P. penetrans* induce rots and cracks in the same plant. Root lesion nematodes often cause oval brown lesions on roots, but also cross-cracks in potato tuber skin (Holgado *et al*. 2009). A typical sign of cyst nematode attack is the bushy root system to which soil tends to adhere. Root-knot nematodes induce root galls of various shape. In strawberry *L. elongatus* causes typical hook-like root tip galls.

Upon detection of these types of symptoms it is recommended to take soil samples for nematode analysis. Carrot is highly vulnerable for nematode attack. The small plants and severe reduction in the marketable yield is now an increasing problem in organic farming.

How work was carried out

Information has been collected from the literature, complemented by general knowledge on nematode occurrence, pathogenicity and recorded field damage in Norway and elsewhere.

References

Hallmann J, Frankenberg A, Paffrath A and Schmidt H 2007. Occurrence and importance of plant-parasitic nematodes organic farming in Germany. Nematology 9: 869 – 879.

Holgado R, Oppen KA and Magnusson C 2009. Field damage in potato by lesion nematode *Pratylenchus penetrans*, its association with tuber symptoms and its survival in storage. Nematol. medit. 37: 25 – 29.